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China Report

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No. 134

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CHINESE DIVERS SET WORLD RECORD

Beijing HAIYANG [OCEANS] in Chinese No 8, 15 Aug 81 p 23

[Article by Ling Zhicun [0407 1807 1317]: "Chinese Divers Set Anoghter World Record"]

[Text] The gate on the Boeing 727 swung open and we were greeted by the pleasant and refreshing breezes from the sea. Stepping onto the ground at the Nice International Airport, we couldn't help feeling cheerful and relaxed. As we bathed in the warmth of the sun and flew along the ocean drive in a milky white sedan, the delightful feeling is hard to describe. Looking around, we saw trees and flowering shrubs beneath the white clouds in the sky and reef rocks and seagulls above the green waves of the ocean. Around the harbor, buildings are gracefully laid out and, in the background, rugged cliffs rise abruptly, making the famous Nice harbor of south France--a Tourist's dreamland--ever so spectacular and attractive. However, we did not come here looking for the wonderful enjoyment. Instead, at the invitation of the Kao-mai-ke-si Diving and Underwater Engineering Company of France, we came specifically to greet the Chinese divers coming out of the depressurization chamber and to share their joy of completing the training session and setting another world record in 200 meter sea saturation diving in and out of the deep diving vessel.

Ten minutes after 7:00 pm on 29 April was a memorable moment. The deep diving vessel "SM360" docked in the harbor against the backdrop of a golden setting sun and the quiet surroundings appeared so serene. But the minds of the Chinese guests and the French technical crew gathered here were as unsettled as a turbulent sea. People's eyes were glued to the gate of the depressurizing vessel and lenses of photographic and movie cameras had already focused on the same target. Instrument readings and the fluorescent screen of television monitors told us that depressurization was progressing smoothly. Pressure in the vessel was approaching normal and the divers felt fine, everything was normal. Some diver was heard inquiring on the speaker about the menu of tonight's graduation banquet. At the turn of the handle, the gate opened and out came the sic Chinese divers. As the cameras repeatedly flashed, people clapped, cheered, greeted and congratualed. Every one of the young divers looked very vivacious and jubilant.

At that moment, one and a half years of difficult training in deep sea industrial diving drew to a victorious conclusion. At the banquet given by the ocean club, all the dives were awarded the highest third grade industrial diver certificates.

The technology of deep sea industrial diving is quite difficult and China has not had this technology in the past. In this diving exercise, six divers lived a full 7 days and 6 nights in the divers cabin of the deep diving vessel "SM360". They first met the challenge of being pressurized to 20 atmospheres in 24 hours and then they dived to a record 206 meters, left the vessel, swam in the deep sea and then returned to the vessel. After they surfaced, the depressurizing process was even more complex than the pressurizing sequence and it took 4 whole days toreduce the pressure to 1 atmosphere.

The first world record of deep sea saturation diving in and out a deep diving vessel was broken in the morning of 22 October 1980 by divers from China and France. They rode in the "SM358" deep diving vessel which measured 7 meters long, 25 meters wide and 2.8 meters high and weighed 12.8 tons. The cockpit holds the pilot and the copilots and the divers cabin holds three divers. At 10:30 am on that day, the vessel reached the target depth of 205 meters after 39 minutes of diving. Of course, the divers entered the divers' cabin from the high pressure chamber more than an hour ago. At 10:33, French diving instructor Ruo-si came out of the vessel first, followed by two young Chinese divers Liu and Shi and French teacher A-lai-ke-si came out last. They lingered underwater for 3 minutes and the vessel reached the surface at 11:16.

At the celebration banquet, we had a chat with the team leader. In more than a year's time, they have overcome various difficulties with the language barrier and with theoretical learning and, with unbending perserverance and courage and loyalty to their country, they finally overcame all the bstacles, succeeded in the actual deep sea diving and wond victory.

The deep diving vessel has the advantages of a submarine and a diving bell. Although a submarine can cruise freely under water, its crew cannot work outside it for any extended period of time. On the other hand, a diving bell can operate in the deep sea but it is limited to one location at a time and cannot move freely under water. A deep diving vessel is different, it not only can move freely underwater but it also allows the divers to work in the water at a certain depth and to carry out observations at greater depths and conduct work with mechanical arms. Consequently, more and more attention is given to the role of the deep diving vessel and deep sea industrial divers while continuous progress is being made in the exploration and development of offshore oil, in the installation of ocean bottom oil pipelines, and in other underwater engineering and refloatation activities. In view of the fact that the training of the young Chinese divers has reached a satisfactory level and based on the sound expectation of the developing trade between the two nations, Board Chairman Mr De-luo-zi of Kao-mai-ke-si Company presented concrete proposals at a reception luncheon for us regarding Sino-French cooperation in deep sea industrial diving. We anticipate even greater collaboration between China and France in this area and wish for speedy development of the Chinese deep sea industrial diving enterprise.

9698
CSO: 4008/3

AUTHOR: ZHANG Qianyuan [1728 0051 0626]
LI Yongsheng [2621 3057 3932]

ORG: None

TITLE: "Storied Industrial Buildings in Shanghai"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 8, 1981

TEXT OF ENGLISH ABSTRACT: The construction of storied industrial buildings in Shanghai started in the 1960's. Since the 1970's storied buildings have been used not only in light and electronic industries, but also in some machine-building industries. At present, many chemical works by built storied buildings according to the technological processes.

1. Main building parameters used in Shanghai: Column spacing: 6 m; Span: 6.0 m, 7.5 m, 9.0 m, 12 m (under experimentation); No of stories: mainly 2-6; Module: 0.6 m for buildings of 6 m in story height, and 1.2 m for those above 6 m; Working load for floor: 500, 750, 1000, 1500 kg/sq m.

2. Structural systems used:
(1) Prefabricated RC beams, slabs and long columns with exposed brackets (most widely used);
(2) Prefabricated RC beams, slabs and short columns;

[Continuation of JIANZHU XUEBAO No 8, 1981]

(3) Prefabricated RC beams and slabs and cast-in-place short columns;
(4) Prefabricated RC beams, slabs and long columns with built-in brackets.

3. The location of high temperature shops in storied buildings, either on the ground floor or on the upper floors, and the relevant problems have been discussed by the authors. The experience on ventilation shafts has also been treated.

4. Generally, shops with heavy equipment and bulky products are located on the ground floor. Care should be taken to avoid including shops which interfere with one another on the same floor or in the same building.

5. Usually 1.5-3 T freight elevators are provided. Bulky raw materials are treated first on the ground floor before taken upstairs.

AUTHOR: ZHENG Naigui [6774 0035 0964]
LIANG Mintao [2733 2404 3325]

ORG: None

TITLE: "Problems in Industrial Building Design"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 8, 1981

TEXT OF ENGLISH ABSTRACT: The authors hold that the role and responsibility of architects in the design of industrial buildings should be sufficiently recognized. It is improper to leave everything to the technology and equipment designers with the architect in a passive position. As a matter of fact, due to the use of the most advanced techniques, industrial buildings are very capable of reflecting the characteristics of the times. Reviewing the development of architectural history, we can see that revolutions in architecture usually began with industrial buildings, for example, the Fagus Shoelast Factory in Germany in 1911, the "Model Factory" at the Cologne Exhibition in 1914, etc. Today, the design of industrial buildings should provide the laborers with good environments for working and living, and also good architecture. New design methods used today, both domestically and abroad, are reviewed in the article. The authors also propose a new structural system of industrial building design with the use of Y-section columns and three-hinged-arch roof-trusses as the main supporting members.

AUTHOR: LI Yuzhou [2621 3342 5297]

ORG: None

TITLE: "Reflections on Architectural Theory"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 8, 1981

TEXT OF ENGLISH ABSTRACT: The author expresses his views on architectural theory. He does not agree with the idea that architectural theory is vague and useless and that there is no necessity for research. Reviewing what we have experienced during the past 35 years, we were usually guided by some ridiculous and fallacious theories, such as classic-revival, figurative and sloganized expressions. Studies on architectural theories in the past years were not founded on a sound basis, thus affecting the assessment of architectural theory.

To handle correctly the important problems in architectural theory, it is necessary to study materialism and dialectics. Some believe that subjective initiation determines architectural style and others hold that "form follows function" is a convention to be thrown to the winds. All such ideas run counter to the basic dialectic principle of "content determines form."

Architectural theory in China has long been influenced by that of the Russians in the 50's, which treated architecture as a plastic art. Renovations in architecture

[Continuation of JIANZHU XUEBAO No 8, 1981]

in the end of the last century was considered to be "the expression of degeneration and decadence of capitalism," with which "socialistic architecture" should be in sharp contrast. The social significance and cognition of architectural forms were exaggerated, classic inheritance and nationalistic forms advocated, and "ideological content" in architecture promoted. The principles of "socialistic realism" and "socialistic content and nationalistic form" in literature and art were improperly introduced into architecture.

The author disagrees that the new architecture of China can be made through some extension of classic members. There should be distinction between "novelty," "freshness" and the newness reflecting the age. The basic content of architectural renovation is to transform construction from a handicraft trade to a mechanized industry, to transform architecture from an art to a scientific technique.

AUTHOR: CHEN Zhanxiang [7115 0594 4382]

ORG: None

TITLE: "Evolution of Architect's Position in History"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 8, 1981

TEXT OF ENGLISH ABSTRACT: The author feels that the resumption of the title of architect in China is quite necessary. The title of architect has a long history. As early as 25 BC in ancient Roman era architect Marcus Vitruvius Pollio, in his "10 Books of Architecture," put forth the requirements of an architect, based on the fact that architecture was the joint production of various branches of learning. During the Middle Ages, however, the title of architect was lost for some time. Since then, the role and position of architect, as well as his ptogram and way of work, have undergone many changes.

The author arrives at the conclusion that the occupation of an architect is never an invariable one. It is inevitable in history that each age sets forth a different task and responsibility in the architect, depending on the different demands of the time. Today the architect plays a more important role in meeting the ever-changing demands of the people. Architectural design should be considered from a comprehensive view of the environment. It is quite an important problem in the architectural circle of all nations. In China, the position of architect must gain social

[Continuation of JIANZHU XUEBAO No 8, 1981]

recognition. Today the architect is not merely one who draws for the client, designs according to the client's desire, or, even worse, fawns upon the personal taste of a certain leader. An architect should therefore clearly realize his historical position and make full use of his initiative; otherwise, creativity in architecture could never be obtained.

9717
CSO: 4009/35

AUTHOR: QI Yingmin [2058 4481 2404]

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TITLE: "Calculation of Methane Emission from Coal Face and Ventilation Air Requirements for a Mechanized Coal Face"

SOURCE: Beijing MEITAN XUEBAO [JOURNAL OF CHINA COAL SOCIETY] in Chinese No 2, 1981 pp 20-29

ABSTRACT: Three major methane emission sources are considered. Methane emission from broken coal is governed by an exponential decay function. The total amount of methane emitted consists of the contributions from quantities of coal cut at successive moments in time; the formula for total methane emission from the broken coal assumes that the quantity of broken coal cut per unit time is constant. Finally, the broken coal methane emission equation allows for the fact that the coal cutting cycle ends at a certain point, so that the amount of broken coal available eventually decreases to zero. Methane emission from the goaf is a function of the pressure difference between the goaf and the working face. Methane emission from the face is a function of its area and its emission coefficient. The total methane emission formula is the sum of these three factors. It has a maximum at the end of the second stage of the coal cutting cycle, so that the expression for the maximum methane emission value can be derived. The methane emission inhomogeneity constant is the ratio of the maximum emission to the average emission. The required air supply is also calculated in terms of the maximum methane emission. The formulas suggest that the required air supply can be decreased by increasing the transport capacity of the conveyor and decreasing the length of the coal transport path.

AUTHOR: PAN Jian [3382 0256]

ORG: Changsha Nonferrous Metallurgy Design and Research Institute

TITLE: "A Verification of the Pipeline Resistance Formula for Two-Phase Flow and an Evaluation of Zhang Guoquan's formula"

SOURCE: Beijing MEITAN XUEBAO [JOURNAL OF CHINA COAL SOCIETY] in Chinese No 2, 1981 pp 48-54

ABSTRACT: Formulas for calculating the hydraulic pressure gradient of liquid-solid mixtures in pipeline transport are numerous, but still leave much to be desired. Recently many efforts at experimental verification of different formulas have been undertaken in China. A computer was used to calculate results for several formulas in common use in China, and these results were compared with more than 400 groups of actual measurement data from China and abroad. The formulas were those of Zhang Guoquan [1728 0948], the Jinquan Nonferrous Metals Company (which modifies the Durand equation by assuming an exponential relationship between the increase in the hydraulic pressure gradient and the volumetric concentration of solid), the Shaanxi Water Conservancy Research Institute, Wang Shaozhou [3769 4801 0719] and the Beijing Central Institute of Nonferrous Metals. The Jinchuan formula and the Shaanxi Water Conservancy Institute formulas give the smallest errors. The Zhang Guoquan formula is found to work well with suspensions of coarse particles but to show increasing errors for finer particle size, greater concentration and higher specific gravity.

8480
CSO: 4009/47

AUTHOR: LIU Zhenrong [0491 6297 2837]

ORG: Institute of Engineering Mechanics, Chinese Academy of Sciences

TITLE: "Application of Graph Theory to Optimization of Nodal Numbering for a Finite Element System"

SOURCE: Beijing SHUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS] in Chinese Vol 2 No 3, 1981 pp 129-137

TEXT OF ENGLISH ABSTRACT: In this paper, the least degree principle in ordering vertices of a graph is used. In the first part, an introduction is given of the general procedure for application of the reversed Cuthill-Mckee (RCM) algorithm to minimize the storage requirement of data during computer implementation for the finite element technique. It is emphasized that renumbering the set of nodal points is but a process to construct a special kind of data structure--the so-called spanning tree. In the second part a computing experiment is carried out to study the effect of different types of element meshes on the result of the RCM scheme. The superiority of the system of right triangular elements with quadratic variation of shape function and the storage requirement are presented in the conclusions.

AUTHOR: SHI Yingguang [0670 2019 0342]

ORG: Computing Center, Chinese Academy of Sciences

TITLE: "On the Simultaneous Best Approximation for Dunham Types"

SOURCE: Beijing SHUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS] in Chinese Vol 2 No 3, 1981 pp 138-142

TEXT OF ENGLISH ABSTRACT: In this paper, we discuss the problem of simultaneous best approximation for the Dunham type, i.e., one of minimization of the functional $\Phi(P) = \max\{\|f^* - P\|, \|f^{**} - P\|\}$. We have given a characterization theorem and proved a strong uniqueness theorem and a continuity one. Finally, we have provided an algorithm for calculating the best approximation.

AUTHOR: WANG Yinchu [3769 1377 0443]

ORG: Computer Installation of Jiangsu Planning Committee

TITLE: "An Algorithm for a Transport Problem with Restricted Ability"

SOURCE: Beijing SHUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS] in Chinese Vol 2 No 3, 1981 pp 143-148

TEXT OF ENGLISH ABSTRACT: This paper is based on the connection of differential method with potential method to solve the general transport problem. We present a method which does not need to store enormous matrix of coefficients of the constraint condition, and the implied information within the closed path of the potential method is used in order that we may obtain the solution of the transport problem with restricted ability.

AUTHOR: WANG Jiamo [3769 0857 6206]

ORG: Ninth Research Institute

TITLE: "Parallel Calculation in an Accumulated Problem"

SOURCE: Beijing SHUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS] in Chinese Vol 2 No 3, 1981 pp 149-155

TEXT OF ENGLISH ABSTRACT: In this paper we give a format for the parallel calculation of a partitional block with the characteristics of a longitude-horizontal parallel computer. It has been used to compute an accumulated problem. The format has provided a good parallel calculational effect.

AUTHOR: ZHU Chuheng [4376 2806 1854]

ORG: None

TITLE: "Application of Interpolation for Definite Integral with Parameters"

SOURCE. Beijing SHUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS] in Chinese Vol 2 No 3, 1981 pp 156-162

TEXT OF ENGLISH ABSTRACT: In this paper the following definite integrals:

$$J(r_1, r_2, \cdots, r_n) = \int_{r_1(r_2, r_3, \cdots, r_n)}^{r_2(r_3, r_4, \cdots, r_n)} F(x)dx,$$

and

$$I(\alpha_1, \alpha_2, \cdots, \alpha_n; \lambda) = \iint_D f(x)g(\lambda y)dxdy$$

are considered, where r_1, r_2, ..., r_n and α_1, α_2, ... α_n, λ are parameters, and the integrated region D is defined by the following relations:

$$\phi_1(\alpha_1, \alpha_2, \cdots, \alpha_n) \leqslant x \leqslant \phi_2(\alpha_1, \alpha_2, \cdots, \alpha_n),$$

$$\varphi_1(\alpha_1, \alpha_2, \cdots, \alpha_n, x) \leqslant y \leqslant \varphi_2(\alpha_1, \alpha_2, \cdots, \alpha_n, x),$$

where $(x, y) \in D$.

A numerical method of computation for definite integral $J(r_1, r_2, \ldots, r_n)$ and

[Continuation of SHUZHI JISUAN YU JISUANJI YINGYONG Vol 2 No 3, 1981 pp 156-162]

$I(\alpha_1, \alpha_2, \ldots, \alpha_n; \lambda)$ is introduced. The author makes use of the interpolation and numerical method of ordinary differential equations as the basic idea for computing $J(r_1, r_2, \ldots, r_n)$ and $I(\alpha_1, \alpha_2, \ldots, \alpha_n; \lambda)$.

AUTHOR: HUANG Fengling [7806 7458 3781]
RUAN Yuxiang [7086 3768 7449]
LIU Zhiyong [0491 5268 3938]
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ORG: All of Qinghua University

TITLE: "Exploration Using Computer for Method Assisting Diagnosis of Acute Abdominal Pain"

SOURCE: Beijing SHUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS] in Chinese Vol 2 No 3, 1981 pp 163-168

TEXT OF ENGLISH ABSTRACT: Two different methods are presented in this paper. One is to simulate a doctor's experience based on fuzzy sets theory. The other is the so-called maximum likelihood method in probability statistics.

Both methods were tested and verified in more than 1000 cases of common acute abdominal pain which were diagnosed by operation or final clinical diagnosis. The results show that the accuracy of simulating the doctor's method is as high as 97.7 percent, while that of the probability statistics method is only 91.2 percent.

AUTHOR: LI Kaitai [2621 7030 3141]
HUANG Aixiang [7806 5337 7449]

ORG: Both of Xi'an Jiaotong University

TITLE: "Iterative Method of the Finite Element Solution for a Nonlinear Boundary Value Problem"

SOURCE: Beijing SHUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS] in Chinese Vol 2 No 3, 1981 pp 169-174

TEXT OF ENGLISH ABSTRACT: If the operator of a nonlinear boundary value problem is a monotone one, then the iterative method of the finite element solution may be given. In doing so, it is not necessary to solve the system of nonlinear algebraic equations, but to construct the basis and the dual basis functions of the finite element subspace. In addition, this article has proved the covergence of the approximate solution.

AUTHOR: WANG Zeke [3769 0463 2688]

ORG: Zhongshan University

TITLE: "An Implementation of Kuhn's Rootfinding Algorithm for Polynomials and Related Discussions"

SOURCE: Beijing SHUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS] in Chinese Vol 2 No 3, 1981 pp 175-181

TEXT OF ENGLISH ABSTRACT: According to a complementary pivoting procedure, H.W. Kuhn presented an algorithm that generates sequences to converge all the roots of a polynomial with complex coefficients. In this paper we give a detailed analysis of Kuhn's algorithm and consider a practical strategy for computation. After giving an outline of the program and a flow chart, some numerical examples are presented and the behavior of the algorithm is discussed. In addition, it is pointed out that the algorithm remains effective for a wide class of transcendental equations.

AUTHOR: LIU Degui [0491 1795 6311]

ORG: None

TITLE: "A Class of Deformation of Ordinary Differential Equations in Calculation of Control Systems"

SOURCE: Beijing SHUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS] in Chinese Vol 2 No 3, 1981 pp 182-190

TEXT OF ENGLISH ABSTRACT: In order to avoid the calculating derivation, an efficient way of numerical integration of ordinary differential equations was proposed by Yuan Zhaoding. In this paper, another new method of substitution is presented. This method either can completely avoid the calculating derivation on the right or can decrease to calculating the $m-n$ order of derivation in numerical integration of ordinary differential equations. The calculation of initial values for solving systems of the equivalent equation is much simpler than that by the transform method.

In this paper the method of substitution is derived and shows that this method is also applicable when an enter variable is a δ function.

AUTHOR: WANG Qi [3769/3823]

ORG: Shenyang Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "On Self-inverse Transformation"

SOURCE: Beijing SHUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS] in Chinese Vol 2 No 3, 1981 pp 191-193

TEXT OF ENGLISH ABSTRACT: In this paper we give a method of generating the self-inverse transformation of the form $S = I - uv^T$ and $S = S^{-1}$, and with its specific form solve the linear equations. The numerical stability is good. The volume of computation is more than the Gauss elimination and less than the Householder method. This paper might be regarded as a note to Tan's article.

9717
CSO: 4009/3

AUTHOR: ZHAO Guanchun [6392 0385 2504]

ORG: Department of Power Machinery Engineering (II)

TITLE: "The Construction and Use of Table and Chart for the Thermodynamic Properties of Supersaturated Steam and an Accurate Equation for Steam Pressure in Equilibrium with Spherical Drops"

SOURCE: Xi'an XI'AN JIAOTONG DAXUE XUEBAO [JOURNAL OF XI'AN JIAOTONG UNIVERSITY] in Chinese Vol 15 No 4, Aug 81 pp 1-12

TEXT OF ENGLISH ABSTRACT: Using the formulas for calculating thermodynamic properties of superheated steam, as proposed by IFC (1976), the author has succeeded in developing a computer program for calculating the thermodynamic properties of supersaturated steam within the region between the saturation line and the 95 percent line of dryness fraction, and has turned the results into a table and a chart accordingly. This paper proposes an accurate equation for the steam pressure in equilibrium with spherical drops. By using such an equation, a simple and accurate method is suggested for computing the critical droplet radius or degree of supersaturation using the supersaturated steam table. To provide a concrete comparison of the relative merits of the suggested method and other methods, it may be cited that over a region up to 250°C, 60 bars and 0.95 dryness fraction, the error of calculation by the new method is less than 1 percent, as compared with 10-26 percent obtained by the other methods.

AUTHOR: CHEN Chunzheng [7115 4783 2973]

ORG: Department of Power Machinery Engineering (II)

TITLE: "The Stability of Rubber-stabilized Air Bearings Used on Medium-pressure Expansion Turbines"

SOURCE: Xi'an XI'AN JIAOTONG DAXUE XUEBAO [JOURNAL OF XI'AN JIAOTONG UNIVERSITY] in Chinese Vol 15 No 4, Aug 81 pp 13-25

TEXT OF ENGLISH ABSTRACT: This paper describes some research results on the rubber-stabilized air bearings used on medium-pressure expansion turbines which are installed in 150 N m^3/h oxygen plants. The author has calculated the instability onset speed of the turbine rotor under different experimental conditions by means of a formula derived from a simplified model. Analysis of the calculation and comparison with experimental results enable the following principal conclusions to be reached: (1) The use of a rubber-stability air bearing can greatly raise the instability onset speed of the rotor. These rubber-stabilized air bearings will operate stably with large radial clearance under low air supply pressure. (2) A change in radial clearance of the rubber-stabilized air bearing does not affect the operating stability within the range of our experiments. (3) The reduction in bearing weight can sufficiently raise the instability onset speed. Therefore, it is preferable to select materials of lower specific weight for the bearing

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body rather than to use a LC_4 shaft. (4) Both the ratio of the damping coefficients and that of the stiffness coefficients of the rubber O-rings and the gas film have optimum values at which the bearings operate with maximum stability. It is obvious that the correct selection of rubber O-rings is very important.

AUTHOR: WANG Xifan [3769 6932 0416]
SHI Hanji [2457 3352 1015]

ORG: Both of the Department of Electrical Engineering

TITLE: "A Direct Solution to the Structure Symmetric Sparse Linear Equations"

SOURCE: Xi'an XI'AN JIAOTONG DAXUE XUEBAO [JOURNAL OF XI'AN JIAOTONG UNIVERSITY] in Chinese Vol 15 No 4, Aug 81 pp 27-42

TEXT OF ENGLISH ABSTRACT: A new type of algebraic simultaneous equations, the structure symmetric sparse linear equation, is discussed in this paper. The paper presents an analysis of its essential properties as revealed in the triangular decomposition process, and discusses the characteristics of three optimal ordering methods for the solution of the structure symmetric sparse equations. Comparison of these methods is given and an optimal ordering method which suits this kind of equation is recommended.

Paralleling the presentation of the optimal ordering method mentioned above, the paper develops an efficient algorithm for directly solving this type of linear equation. The method can easily be extended to solving symmetric sparse linear equations. The paper also contrasts the newly developed algorithm with the variable band method that has found wide application in China.

AUTHOR: ZOU Lihe [6760 3810 0735]

ORG: Department of Information and Control Engineering

TITLE: "Orthogonal Invariance in Integral Transforms"

SOURCE: Xi'an XI'AN JIAOTONG DAXUE XUEBAO [JOURNAL OF XI'AN JIAOTONG UNIVERSITY] in Chinese Vol 15 No 4, Aug 81 pp 43-50

TEXT OF ENGLISH ABSTRACT: This paper presents a concept of orthogonal invariance in linear transforms; that is, if any orthogonal set of functions can keep its orthogonality invariant after a linear transform, this transform is defined as possessing the property of orthogonal invariance transform (OI). Necessary and sufficient conditions are developed for integral transforms and for linear systems. An integral transform is an OI if and only if the complex conjugate inner product of its kernel is an impulse function; and a linear system is an OI if and only if its magnitude of transfer function is uniform in spite of its phase characteristic. The OI concept can be used in the fields of signal analysis, data transmission, digital signal processing, etc.

AUTHOR: ZHANG Jinghui [1728 2529 4940]

ORG: Department of Engineering Mechanics

TITLE: "Analysis of Structural Response to a Sequence of Random Impacts"

SOURCE: Xi'an XI'AN JIAOTONG DAXUE XUEBAO [JOURNAL OF XI'AN JIAOTONG UNIVERSITY] in Chinese Vol 15 No 4, Aug 81 pp 51-58

TEXT OF ENGLISH ABSTRACT: The main content of this paper may be summarized as follows:
(1) The mode of the response of a system with single degree of freedom to a sequence of random impacts can be idealized as an exponential oscillation decay,
(2) The analytical method is presented that handles the response of a complex system to a "structural shock wave," widely encountered in practice.

A technique for obtaining the parameters of the "structural shock wave" from experimental data is proposed.

AUTHOR: LIN Yuqi [2651 3022 6936]

ORG: Department of Engineering Mechanics

TITLE: "Equivalent Bending Moment Method for the Calculation of Beam (or Shaft) Deflections"

SOURCE: Xi'an XI'AN JIAOTONG DAXUE XUEBAO [JOURNAL OF XI'AN JIAOTONG UNIVERSITY] in Chinese Vol 15 No 4, Aug 81 pp 59-69

TEXT OF ENGLISH ABSTRACT: In this paper a numerical method for calculating beam (or shaft) deflections is developed. A new concept of equivalent bending moment has been introduced, whence comes the term "Equivalent Bending Moment Method" (EBMM).

The basic idea of EBMM is that a beam region expressed by a bending moment equation is substituted by a beam region with invariable equivalent bending moment. By means of the substitution the amount of calculation of beam deflection is reduced and precise results are obtained. Furthermore, this method is readily adaptable to computer programming.

EBMM can be used to evaluate the deflection of statically determinate and indeterminate beams, that of beams with constant and step variable cross sectional areas

[Continuation of XI'AN JIAOTONG DAXUE XUEBAO Vol 15 No 4, Aug 81 pp 59-69]

and of combinatory beams (or shafting). When this method is applied to beams (or shafts) with step variable cross sectional areas under complex loads, its advantage is most noticeable.

This method can also be extended to the calculation of frames.

AUTHOR: CAI Rufen [5591 1172 5358]
LU Zhenrong [4151 2182 2837]

ORG: Both of the Department of Basic Courses

TITLE: "A Study of the Numerical Analysis, Programming and Plotting Software for the Approximate Representation of an Ellipse"

SOURCE: Xi'an XI'AN JIAOTONG DAXUE XUEBAO [JOURNAL OF XI'AN JIAOTONG UNIVERSITY] in Chinese Vol 15 No 4, Aug 81 pp 71-82

TEXT OF ENGLISH ABSTRACT: Based on a comparison of various drawing methods, this paper presents a numerical analysis of the representation of an ellipse that best approximates the accurate one. The functional relationship between the two radii of the ellipse, its revolving angles and four parameters, needed for automatic plotting, is obtained.

After establishing this mathematical model, four circular arcs are used to realize the simulated plotting of this ellipse. Then the circle interpolation method of the HTJ-1855 computer graphics system is used to edit the graphics software which is stored as a subroutine in the macro instruction library of the system.

This subroutine is provided to be called at any time by the designers if needed for plotting ellipses of any size and any orientation of major axes.

AUTHOR: GAO Yingcai [7559 2019 2088]

ORG: Department of Mathematics

TITLE: "Semi-discrete Method for Second Order Equation Time-dependent Problems--Computation and Error Estimation"

SOURCE: Xi'an XI'AN JIAOTONG DAXUE XUEBAO [JOURNAL OF XI'AN JIAOTONG UNIVERSITY] in Chinese Vol 15 No 4, Aug 81 pp 83-95

TEXT OF ENGLISH ABSTRACT: In this paper, a finite element approximation solution is established by a finite element discrete space variable, and by characteristic function expansion of time variable for hyperbolic and parabolic equations. This is the so-called semi-discrete method. In addition, the L^2-error estimation of approximation solution is obtained. The results of computation by the semi-discrete method are then compared with the correct solution.

AUTHOR: WU Songzheng [1566 2646 2823]
CHEN Shoutian [7115 1108 3944]

ORG: Both of the Department of Electrical Engineering

TITLE: "On the Model of Negative Valued Dielectric Losses"

SOURCE: Xi'an XI'AN JIAOTONG DAXUE XUEBAO [JOURNAL OF XI'AN JIAOTONG UNIVERSITY] in Chinese Vol 15 No 4, Aug 81 pp 97-106

TEXT OF ENGLISH ABSTRACT: This paper investigates the influence of surface resistance and the width of the guard electrode gap on dielectric losses when measured at power frequency. It is found that the vaseline-gap T-network cannot be sufficiently described in respect to the cause of negative value arising when dielectric losses. The paper also points out that the width of the gap should be as narrow as possible rather than as wide.

AUTHOR: YANG Gao [2799 4108]

ORG: Department of Power Machinery Engineering (I)

TITLE: "The Determination of the Time Lag of the Pressure Measurement System with Intermittent Air Purging"

SOURCE: Xi'an XI'AN JIAOTONG DAXUE XUEBAO [JOURNAL OF XI'AN JIAOTONG UNIVERSITY] in Chinese Vol 15 No 4, Aug 81 pp 107-116

TEXT OF ENGLISH ABSTRACT: Intermittent purging can be used in the pressure measuring system of a wet-steam Laval nozzle test facility. The author has made a quantitative analysis of the effect of the response time t^* of the purging system on the measurement of pressure. A mathematical model for this system is first formulated and the author then derives an equation that is good for engineering use. Experimental equipment has been designed for the verification of the theoretical analysis and tests are made to determine the response time t^*.

The accuracy of the equation has been proved ty the experiment. The results of this research may contribute to the rational design and correct operation of the pressure measurement system for wet-steam flows.

9717
CSO: 4009/5

AUTHOR: ZHOU Bangxin [0719 6721 2450]
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ORG: None

TITLE: "Recrystallization of Al and Cu Single Crystals after Tensile Deformation"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 363-373

TEXT OF ENGLISH ABSTRACT: An investigation was conducted of the relationship between the orientations of recrystallized grains, the deformation amount and the tensile temperature with the tapered single crystals of Al and Cu. In Al single crystals, the orientations of recrystallized grains became concentrated when plastic deformation fully entered into the third work hardening stage during tensile test at -78 - 300°C, and had a crystallographic relationship with the deformed parent in rotating around the [1$\bar{1}$1] about 30-50°C, but it was random after tensile test at -196°C. In Cu single crystals, the orientations of recrystallized grains were also random after tensile test at 20-400°C.

In consideration of the difference of stacking fault energy in Al and Cu and in Al with decreasing temperature, the deformed structure in the third work hardening stage would be different. From the point of view of the nucleation of recrystallization occurring by the growth of subgrains of large difference in orientation

[Continuation of JINSHU XUEBAO Vol 17 No 4, Aug 81 pp 363-373]

with the surrounding matrix and of taking the lead during the recovery process, the different relationship between the orientations of recrystallized grains and the deformed parent can be explained.

AUTHOR: ZHAO Bolin [6392 0130 7792]
et al.

ORG: None

TITLE: "On the Space Group of μ-phase in Superalloy GH302--Electron Diffraction of Primitive Hexagonal Lattice μ-phase"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 386-393

TEXT OF ENGLISH ABSTRACT: A study was made of the electron diffraction patterns of extracted μ-phase which were identified with those of X-ray powder diffraction in superalloy GH302. It is shown that the reflections with $-h+k+l \neq 3n$ spots, e.g., {100}, {200}, etc., in the [001] zone and $\{1\bar{1}0\}$, $\{\bar{1}01\}$, etc., in [111] zone (indexed as hexagonal) are forbidden for the $R\bar{3}m$ space group. These "forbidden" diffractions cannot be attributed to double diffraction with either non-zero Laue zone or other phases, such as $MgZn_2$ type Laves phase. Based on diffraction extinction law, it seems to be a primitive hexagonal lattice (P6). Its lattice constant is consistent with that of μ-phase ($R\bar{3}m$) described as hexagonal. It may be a kind of local-ordering structure of μ-phase.

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et al.

ORG: All of Beijing University of Iron and Steel Technology

TITLE: "Effect of Temperature Distribution Around the Molten Slag Pool on Ingot Quality during ESR Process of Superalloy"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 394-402

TEXT OF ENGLISH ABSTRACT: The effect of temperature at slag face on Al and Ti control and the relation between temperature distribution around liquid metal pool/molten slag pool interface and quality of ingot surface have been investigated during ESR process of superalloy. If the insulation of the mold from its base plate was poor and rather higher temperatures appeared at slag face, in the later refining stage the rate of O_2 penetration to slag from atmosphere, $v_{s-g}^{O_2}$, is two to three times faster and also in the earlier stage the tendency toward the Al increasing is greater than that of good insulation. An increase in voltage may cause the temperature at slag face to rise and the Ti loss to accelerate, e.g., every 0.03 percent more Ti loss at nearly 1 V increase. The temperature distribution around liquid metal pool/molten slag pool interface may be expressed by $\ell \cdot dt^{B/d}$ (B<0),

[Continuation of JINSHU XUEBAO Vol 17 No 4, Aug 81 pp 394-402]

and has a great influence upon the quality of the ingot surface. The method to ascertain this temperature distribution is presented. The evaluation of quality may be proposed by the change of slag coating thickness, $\delta = B/(\ln t_i - \ln t)$. It is shown that the quality of ingot surface is perhaps dependent on the electric current distribution in the molten slag pool, the heat conducting conditions at mold wall, the liquid temperature of slag and the change of all factors affecting the temperature at the "high temperature region."

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TITLE: "Preliminary Studies on Kinetics of High Pressure Hydrogen Reduction of Nickel Ion in Aqueous Solution to Metallic Nickel"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 403-411

TEXT OF ENGLISH ABSTRACT: Studies were made on high pressure hydrogen reduction of Ni ammoniacal solution to metallic Ni with fine Ni powder, which was also prepared by hydrogen reduction with Cr^{2+} as nucleating agent, added as solid seed. Results indicate that the reduction was carried out under chemical reaction rate control region. The rate of reduction is proportional to the amount of Ni powder as solid seed added, and to the square root of partial pressure of hydrogen, and is not influenced by the concentration of Ni ion in solution up to most of Ni reduced. Both activation of hydrogen molecules and phase transformation of Ni are believed to proceed on the surface of Ni powder added. The reaction can be considered to proceed according to the following scheme with reaction 4 as the rate controlling step:

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$$(1)\ H_2(g) \rightleftharpoons H_2(1) \qquad \text{fast}$$

$$(2)\ H_2(1) \xrightarrow{\text{nuclei}} 2H^{\bullet} \qquad \text{fast}$$

$$(3)\ (Ni^{2+}) \xrightarrow{\text{nuclei}} (Ni^{2+}) \qquad \text{fast}$$

$$(4)\ 2H^{\bullet} + (Ni^{2+})^{\bullet} \xrightarrow{\text{nuclei}} Ni^{0} + 2H^{+} \qquad \text{slow}$$

$$(5)\ 2H^{+} + 2NH_3 = 2NH_4^{+} \qquad \text{fast}$$

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TITLE: "Deterioration of Aluminide Coating on Nickel-base Superalloys"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 412-417

TEXT OF ENGLISH ABSTRACT: The deterioration of aluminide coating formed on two cast nickel-base superalloys by pack cementation or by vapor calorizing under reduced pressure has been investigated. To evaluate the coating stability, the oxidation tests were made by exposure to static air under 800-1000°C for 3000-5000 h or 1100°C for 100 h. The microstructures of these coatings formed not only by both processes but also on both alloys are quite similar. It is observed that the outer zone of coating consists mainly of NiAl and Ni_2Al_3 phases on which the Ti (C, N) and Al_3Ti are dispersed; and the inner zone is composed of NiAl, Ni_3Al, Ti (C, N), $M_{23}C_6$ and M_6C near the underlying metal. The deterioration of the aluminide coating after a long-term exposure at elevated temperature seems to be closely related to the phase transformation of the outer zone, the sequence of which may be as follows:

[Continuation of JINSHU XUEBAO Vol 17 No 4, Aug 81 pp 412-417]

$$Ni_2Al_3 + NiAl(\text{enriched in Al}) \rightarrow NiAl(\text{enriched in Ni}) \rightarrow NiAl + Ni_3Al \rightarrow Ni_3Al \rightarrow Ni_3Al + \gamma$$

The Ni_2Al_3 and NiAl(enriched in Al) phases are extremely unstable and disappear after a short exposure below 1000°C, while NiAl(enriched in Ni) phase is very stable and not even altered to Ni_3Al after being oxidized at 900°C for 5000 h. The nucleation of the Ni_3Al phase along the grain boundary of NiAl indicates the initiation of coating deterioration. An end of its deterioration is that the transformation of NiAl into $Ni_3Al + \gamma$ is just finished. The granular phases in the inner zone are carbides, mainly $M_{23}C_6$ or M_6C differing with either alloy, all of them disappearing at 1100°C. It is also found that the σ phase in the diffusion zone may vanish after 100 h exposure at 1000°C.

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TITLE: "Changes in Structure, Magnetic Anisotropy and Magnetic Domain of Amorphous Gd-Co Alloy Films"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 418-423

TEXT OF ENGLISH ABSTRACT: Changes in the structure and the magnetic domain patterns in amorphous Gd-Co alloy films after annealing at room temperature in a low vacuum of 10^{-2} mm Hg for two weeks as well as heating in a high vacuum of 5×10^{-7} mm Hg were investigated by electron diffraction and Lorentz electron microscopy. It was found that the phase separation could be achieved either by annealing at room temperature in a low vacuum or by heating in a high vacuum. The diffraction intensity profiles of the films and their magnetic domain patterns were changed as a result of phase separation. The nearest neighbor coordination number between Gd and Co atoms was obviously decreased, meanwhile the magnetic bubbles in the domain patterns apparently decreased or even disappeared, resulting in the fact

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that the in-plane domain appeared. This proves once again that the magnetic anisotropy in amorphous Gd-Co alloy films is definitely related to the nearest neighbor coordination number between Gd and Co atoms and that the latter may be intuitively shown in the electron diffraction intensity profile.

It was also found that during heating at 350°C, Co crystallized first with α-Co as its main product and β-Co the subordinate. The α-Co gradually transformed into β-Co with the increase in temperature. The oxidation of Co had not been observed even at 950°C, while Gd was oxidized seriously before its crystallization. No trace of Gd-Co alloy or metal Gd could be found in the whole process of crystallization.

The change of the magnetic domain patterns with the heating temperature was shown in the present paper. The influence of both the phase separation and the degree of short range order on the magnetic anisotropy in films was discussed.

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TITLE: "30MGs·Oe Sm-Co Permanent Magnets Prepared by Liquid Phase Sintering"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 424-432

TEXT OF ENGLISH ABSTRACT: A study was made of the optimum composition of 2-17 type Sm (Co, Cu, Fe, Zr)$_z$ magnets. It shows that Sm content is about 27 wt percent, instead of the 25.5 wt percent reported by Ojima. It is shown that the liquid phase sintering process, rather than a simple solid phase sintering, is favorable for controlling and adjusting exactly their compositions, for playing a fully active role in step aging treatment, for enhancing strongly the coercivity and energy product and for successfully preparing magnets with excellent properties. The highest value of the energy product, 30.5 MGs·Oe, has been obtained.

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TITLE: "Effect of MnS and Slab Reheating Temperature on Properties of Oriented Grain Fe-3 percent Si"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 433-440

TEXT OF ENGLISH ABSTRACT: The suitable contents of such effective constituents determined on the basis of the MnS process may be available to produce the oriented-grain Fe-3 percent Si as: C 0.03 - 0.05 percent, Mn 0.06 - 0.08 percent, S 0.018 - 0.025 percent, [Mn] [S] = (11-20) x 10^{-4} and O_2 0.007 percent. The magnetic properties of Fe-3 percent Si have also been influenced by the slab reheating temperature. It was observed that with the raise of the reheating temperature, the primary grain size was reduced and the secondary coarsened, and thus its magnetic properties could be remarkably improved, $B_{10} > 1.78$ Wb/m^2, and stabilized. The proper reheating temperature became relatively insensitive to the magnetic properties when an appropriate amount of Al and N_2 was added. The secondary grains

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may coarsen and the B_{10} value may improve further. The starting temperature of the secondary recrystallization seems to be in correspondence with that at the beginning of rapid growth of primary grains and of the aggregation of MnS particles.

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TITLE: "An Investigation of Fine Grains in the Product of Oriented-grain Silicon Steel Sheet with High Induction"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 441-446

TEXT OF ENGLISH ABSTRACT: The fine grains in the product of oriented-grain silicon steel sheet with high induction have been investigated using the metallographic etch pits technique. It was shown that when the slab was reheated under an exceedingly high temperature, the hot rolled band of large elongated grain structure may be produced, and its {100}⟨011⟩-⟨001⟩ components in the primary recrystallization texture are enhanced. In these regions the primaries are enlarged and the lined grain structure appears after the final annealing. While the slab is reheated under lower temperatures, the product in which the solution of the MnS and AlN is not yet completed may be obtained with mixed grain structure. In addition, it is presented that the lined fine grain structure could be reduced or prevented by increasing the carbon content of the steel, by raising hot reduction or by adopting two stages in cold rolled process.

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TITLE: "Effect of FeO_n on Properties of Converter End Slag (Low P Content)"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 447-453

TEXT OF ENGLISH ABSTRACT: The effect of FeO_n on the properties of converter end slag (low P content) has been studied with phase diagram analysis and petrograph observation. Referring data taken from end slag of oxygen blow converter to the $CaO-SiO_2-FeO_n$ system, the phase equilibrium under elevated temperatures is calculated and regressed. Thus, the relationship between FeO_n contained and percentage of balanced liquid phase in converter slag (low P content), of which C_2S, C_3S and CaO already crystallized out, may be obtained. It is demonstrated that adjustment of FeO_n content is significant in relation to the properties of the converter end slag. Furthermore, certain problems, such as the slag viscosity, "slag melting" and slag making with respect to slag properties, have also been discussed.

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TITLE: "Determination of Equilibrium Constant for Silicate Melt Polymerization and Its Application"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 454-460

TEXT OF ENGLISH ABSTRACT: An attempt was made to ascertain the correlation of equilibrium constant of the polymerization of binary silicate melts with the chemical bond parameters, such as ratio of the effective nuclear charge of metallic ion to its radius, as well as the ionization potential and electronegativity in Allred-Rochow scale. The three-parameter equation derived was employed to estimate the equilibrium constant by which the polymerization of certain binary silicate systems is characterized. It also evaluated the activities of metallic oxides, the anion distribution in silicate and mean chain length, etc., in connection with expression of polymerization. The results show that both free oxygen ion concentration and degree of silicate polyanion polymerization increase with the increase of the charge-radius ratio, ionization potential and electronegativity in Allred-Rochow scale. Fair agreement of the calculated values of activities with experimental data was found. This may be available to predict some properties of silicate melts.

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ORG: NING and WANG both of the Institute of Precious Metals; YUAN of the Nanjing Institute of Glass Fiber

TITLE: "A Bond Parameter Approach to Wettability of Molten Glass on Pt Alloy"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 461-466

TEXT OF ENGLISH ABSTRACT: The bond parameter approach to the wetting behavior of molten glass on certain Pt alloys was attempted on the basis of their equilibrium contact angle tests. It seems to indicate that the dependence of the wetting behavior on the bond parameters of pure metals and Pt-alloy constituents, as well as glass components themselves, may be qualitatively generalized.

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TITLE: "Evaluation of Brittle-fracture Surface Energy in Cubic Metals by Lattice Dynamic Method"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 467-477

TEXT OF ENGLISH ABSTRACT: Using the method of linear response theory in lattice dynamics on the basis of Tyson's model, the response displacements of atoms on cleavage plane on incipient brittle fracture were derived and an expression for evaluating brittle fracture surface energy of metals was found. The brittle fracture surface energy for a number of bcc and fcc metals has been calculated and the results coincide with the order of magnitude in experimental measurements.

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ZHANG Zhonglin [1728 0022 2651]
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TITLE: "Double-specimen Method for J_{IC} Testing"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 478-483

TEXT OF ENGLISH ABSTRACT: Based on the linear relationship between Δa and Δp of a cracked specimen in the stable growth stage and after yielding of the toughness band, a new method using double-specimen for J_{IC} testing was developed by essential estimation of medium or high toughness materials. Its simplicity and accuracy may be available to the industrial laboratories on the requirement of engineering design.

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TITLE: "On the Self-powdering of RE-Si-Fe Alloy"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 484-488

TEXT OF ENGLISH ABSTRACT: An investigation of self-powdering of RE-Si-Fe alloy was conducted by means of X-ray diffraction analysis and electron microscopy. It is identified that the presence of REP, or CeC_2, La_2C_3 may be the cause of self-powdering when it is exposed to weather or soaked in water. Its self-powdering behavior is aggravated by both hydrogen embrittlement and stress corrosion.

9717
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TITLE: "The Development of Microwave Non-destructive Moisture Measuring Apparatus"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 1-9

TEXT OF ENGLISH ABSTRACT: In this paper, the basic theory of non-destructive moisture measuring by microwave is briefly introduced. The composition of the 3 cm wavelength apparatus is described, as well as its principal technical characteristics. The features of the apparatus are: powerful microwave generator, 4~6 watt output; two operating conditions; continuous equiamplitude oscillation; high sensitivity microwave receiver, limiting sensitivity is 120 dB/W. This means that the apparatus has a wider range. The method of calibration and its errors are discussed in detail. Several typical curves obtained as a result of experimentation of building materials as well as in moisture measuring of some walls are presented. Regarding effects on factors, such as salt content in building materials and wall, rendering surface, distribution of reinforcement bars in wall construction, temperature, etc., microwave moisture measurement is described.

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TITLE: "Minimal Displacement-to-Frequency Converter"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 10-17

TEXT OF ENGLISH ABSTRACT: This paper presents the principle and mathematical analysis of a new minimal displacement-to-frequency converter which is based on the t application of the multivibrator. In order to make wide use of the converter, this paper introduces a pressure-to-minimal displacement converter and a frequency-to-voltage converter which are relative to the applications of the minimal displacement-to-frequency converter. In addition, this paper presents a pressure-to-voltage converter which is based on this principle. These simple and cheap converters may be used to measure minimal displacement up to 0.01 μ and pressure of 10^{-4} kgf/cm^2 with the pressure varying rapidly.

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TITLE: "A New Multifunctional Apparatus for Measuring Thermophysical Properties"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 18-25

TEXT OF ENGLISH ABSTRACT: In this paper a new continuous adiabatic plate type calorimeter based constant heating rate has been designed and constructed. By this calorimeter it is possible to measure simultaneously the thermophysical properties, such as specific heat and thermal conductivity in solid and liquid states, and latent heat of the phase change materials. Theoretical analysis is carried out for this apparatus and the measuring technique based on the theory presented is described. Measurements of the thermophysical properties of the H_2O, glycerine and $Na_2SO_4 \cdot 10\ H_2O$ shows that the data obtained using the apparatus described agree well with those of the reference bookr. The error of the apparatus is analyzed.

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TITLE: "Magnetic Circuit Design of Magnetic Lenses"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 26-34

TEXT OF ENGLISH ABSTRACT: Using the field distributions of appropriate models which closely approximate the geometric shapes of some typical magnetic lenses, the flux density along the surface of a magnetic cir cuit, the flux entering it and hence the flux density at different positions within the magnetic circuit can be calculated. The resulting expressions are simple and easy to use. Special attention is paid to the crucial parts of the magnetic circuit, such as the pole pieces and the bottom part of the iron core. This sort of calculation was applied to the design of the objectives of our transmission electron microscope DX-4 and the scanning electron microscope DX-3A. The error in the prediction of flux density within the magnetic circuit was found to be less than 20 percent. The method discussed in this paper can thus be used as an approximate but quick way of designing a magnetic circuit if a certain safety factor is taken into account.

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TITLE: "A Precise Collimation Design of the Electrical Part in Photo-transit"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 35-49

TEXT OF ENGLISH ABSTRACT: If the telescope in a transit is replaced by a photo-collimator, it is called "photo-transit." It is the main collimation equipment in missile transmitting fields. This paper introduces the theory and practice of precise collimation design of the electrical part in photo-transit. Photo-transformation circuit of the narrow-gap vibration is the center of the precise collimation design. We analyze it theoretically and propose the optimal design approach. The vibrator is a very important element in narrow-gap vibration. Its design principles, practices and installations are given. The azimuthal resolution of precise circuit is 0.5 seconds under the condition of 15M distance between photo-transit and the mirror.

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TITLE: "The Analysis of the Effects of Dry Friction on Low-speed Performance of Servo System"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 50-57

TEXT OF ENGLISH ABSTRACT: How to improve low-speed performance of servo systems is one of the important subjects confronting system designers. There are many factors affecting low-speed performance, one of which is the static and kinetic dry friction in the actuator. The main effect of dry friction on the motion of a servo system is that it causes unsteady motion of the drive shaft at low speed. In this paper, response of a typical DC servo system with static and kinetic dry friction to ramp input has been analyzed by means of piecewise-linear and state-variable methods. The system includes a position feedback, a rate feedback and a PI cascade compensator. Both effects of static and kinetic dry friction on low-speed performance of servo system and how to modify it are discussed.

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TITLE: "Determination of Optical Parameters in Designing a Scanning System for Thermal Imaging Purposes"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 58-64

TEXT OF ENGLISH ABSTRACT: This paper describes the derivation of some equations in accordance with the principle of scanning movement of a polyhedral mirror drum. The equations are the relationship between circumcircle radius of the drum, effective aperture of objective lens, relative position of the optical axis of objective lens with the rotating center of the drum, and effective scanning angle of the drum on each side. For straightforwardness eight illustrative graphs are given. Another equation according to the principle of plane mirror imaging is introduced also. It derives the scanning locus equation for detector image on the objective plane.

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TITLE: "The Harmonious Analysis Method for Estimation of Grating Signal Quality"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 65-71

TEXT OF ENGLISH ABSTRACT: This paper gives a harmonious analysis method for the estimation of grating signal quality. The whole data of all quality indices of grating signals may be obtained by this method in one measurement. The measuring data are treated by an electronic computer with BASIC language programming.

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TITLE: "A Discussion of Output Spectra of DELTIC and Compressed-time Correlator"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 72-81

TEXT OF ENGLISH ABSTRACT: In this paper the output spectra of DELTIC and compressed time correlator can be expressed by means of delay theorem and principle of sampling oscillogram. The expression may be useful in engineering design of the correlator which may be applied to spectral analysis and signal detection.

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TITLE: "Development of Smallbore High Efficiency Column with a New Chemically Bonded Alkyl Stationary Phase"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 82-89

TEXT OF ENGLISH ABSTRACT: A smallbore chemically bonded alkyl stationary phase column of 2 mm ID and 15 cm in length, having an efficiency of 6400~7600 theoretical plates, has been developed. The column efficiency is nearly the same as that of the routine analytical column of 4.6~5.0 mm ID. The amount of eluent used for the smallbore column, however, is less than about one-fifth that of the ordinary column. Using the reaction of monochlorosilane with 5 μm accumulated silica bead instead of trichlorosilane and irregular silica gel, we prepared a nonpolar chemically bonded phase packing which has a higher carbon content and more obvious hydrophobicity. Moreover, the reproducibility of the preparation is better. The equipment and assembly necessary for getting high efficiency with the smallbore column is discussed briefly. By use of Model SW-1 smallbore column HPLC instrument with the Model K-1 column fittings and injector, the detector with small cell

[Continuation of YIQI YIBIAO XUEBAO No 3, 1981 pp 82-89]

volume and the pump delivering solvent at low flow rate, satisfactory results have been obtained. Some examples of application are shown in the paper.

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TITLE: "Another Equivalent Transformer Circuit--A Theoretical Analysis Method for Transformer Bridge"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 90-96

TEXT OF ENGLISH ABSTRACT: In this paper, according to the fundamental principle of transformers, a more reasonable equivalent mutual circuit is proposed. The equivalent circuit considers the magnetic association between each winding as well as the core loss. It is an accurate analysis method. Finally, the concept of equivalent circuit is adopted to analyze ordinary transformer of two or three windings, with valuable results. Although the equivalent circuit is derived from analysis of the transformer bridge, it is suitable for analysis of the transformer in other cases with more strict requirements.

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TITLE: "Air-jet Loom with Profiled Reeds"

SOURCE: Shanghai FANGZHI XUEBAO [JOURNAL OF TEXTILE RESEARCH] in Chinese No 4, 1981 pp 7-11,16

TEXT OF ENGLISH ABSTRACT: This article deals with experiments and analysis of the air current distribution, air pressure and the speed of the air stream through the weft insertion race in relation to the weft flying in the weft insertion system using relay principle. Thus, main rational construction data and technology parameters are obtained. Through practical running, the air jet loom with the above investigation results proves able to achieve an actual weft insertion rate of 816 m/min for the reed width of 2.4 m.

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TITLE: "A Study of the Reaction of Cellulose Fibers to DMEU"

SOURCE: Shanghai FANGZHI XUEBAO [JOURNAL OF TEXTILE RESEARCH] in Chinese No 4, 1981 pp 25-33

TEXT OF ENGLISH ABSTRACT: From experiments on the anti-crease finishing of cotton and rayon fabrics with DMEU the main conclusions are obtained as follows:
(1) Under the present curing conditions, both the rate of fixation and that of covalent cross-linking onto the cellulose are proportional to the concentration of DMEU in formulations, but not related to the effective hydroxyl content of the cellulose. In other words, it is a pseudo first order reaction. In consideration of the orientation property of the reaction on fibers, it is possible to consider that, as a whole, the complicated reaction is generally of the first order, and is an oriented and irreversible reaction.
(2) During curing the etherification of cellulose is the prevailing reaction. Raising the curing temperature will increase the fixation of DMEU and improve the cross-linking formation. Under the present experimental conditions activation energy of fixation of DMEU is E=12 Kcal/mol and impact factor A is 6×10^5 min^{-1};

[Continuation of FANGZHI XUEBAO No 4, 1981 pp 25-33]

activation energy of cross-linking development is E=9 Kcal/mol and impact factor A is 6.6×10^{-3} min^{-1}.
(3) In the precondensation solution, the increase of the ratio CH_2O/CEU facilitates the developments in cross-linking. In the process, the loss of formaldehyde must be prevented as much as possible, otherwise the density of corss-linking would be lowered and the degree of self-condensation and side-chain would be increased.

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TITLE: "Separation and Preparation of Standard Cyclic Trimer Sample from PET Fiber and Determination of Its UV Extinction Coefficient"

SOURCE: Shanghai FANGZHI XUEBAO [JOURNAL OF TEXTILE RESEARCH] in Chinese No 4, 1981 pp 38-39

TEXT OF ENGLISH ABSTRACT: We have obtained a colorless rhombic single crystal of cyclic trimer by means of a new procedure from dyed and undyed polyester fibers. The crystal size is on a millimeter scale. Using this sample, we have prepared a standard solution and obtained a standard curve for UV analysis. Its extinction coefficient at 240 nm wavelength is $\varepsilon(240\ nm) = 59.34 \times 10^3$ L. Mol^{-1}. cm^{-1}.

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TITLE: "An Analysis of Detaching and Overlapping Processes on Cotton Comber"

SOURCE: Shanghai FANGZHI XUEBAO [JOURNAL OF TEXTILE RESEARCH] in Chinese No 4, 1981 pp 49-54

TEXT OF ENGLISH ABSTRACT: Based on the calculation of the operation curves and the technical characteristics of the detaching rollers on certain cotton combers, both domestic and imported, this paper gives a theoretical analysis of the main parameters of the detaching and overlapping process, as well as the effects of such parameters on the production efficiency, and thus some proper technical parameters of the process on cotton comber are obtained.

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